

**2nd International Workshop –Exhibition  
“Strategy of Development of Large-Scale Research  
Infrastructures  
of the Russian Federation & Cooperation with the European  
Union”**

**September 7-8, 2009**



# **"ISTC - a Convenient Legal and Organizational Framework for Start Up Activities/Projects in the Large Scale Research Infrastructures program"**

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International Science and Technology Center,  
ISTC, Moscow**



[www.istc.ru](http://www.istc.ru)

# What is ISTC?



- An intergovernmental organization focused on responsible management of sensitive (dual use) knowledge and technology through international, cooperative science and technology projects
  - Provides research grants for civilian projects engaging experts with “sensitive” knowledge
  - Provides funds for projects solving problems of global/regional dimensions
  - Very convenient framework for partner (funded) projects
- A technology matchmaker between Russian/CIS R&D institutes and western companies.
- A tool to integrate Russian/CIS scientists into the international research community



# ISTC Core Programs and Services



- **Regular Science Project Program**
- **Partner Project Program**

- Commercialization/Innovation Support Program
- Patenting and IPR protection Program
- Competence Building Program

- Workshop and Scientific Seminars
- Mobility Program: Travel Grants
- Communication Support Program

- Partner Promotion Program
- Programmatic Approach



# ISTC - 15 Years of Operation



## More than 2650 funded science and technology projects

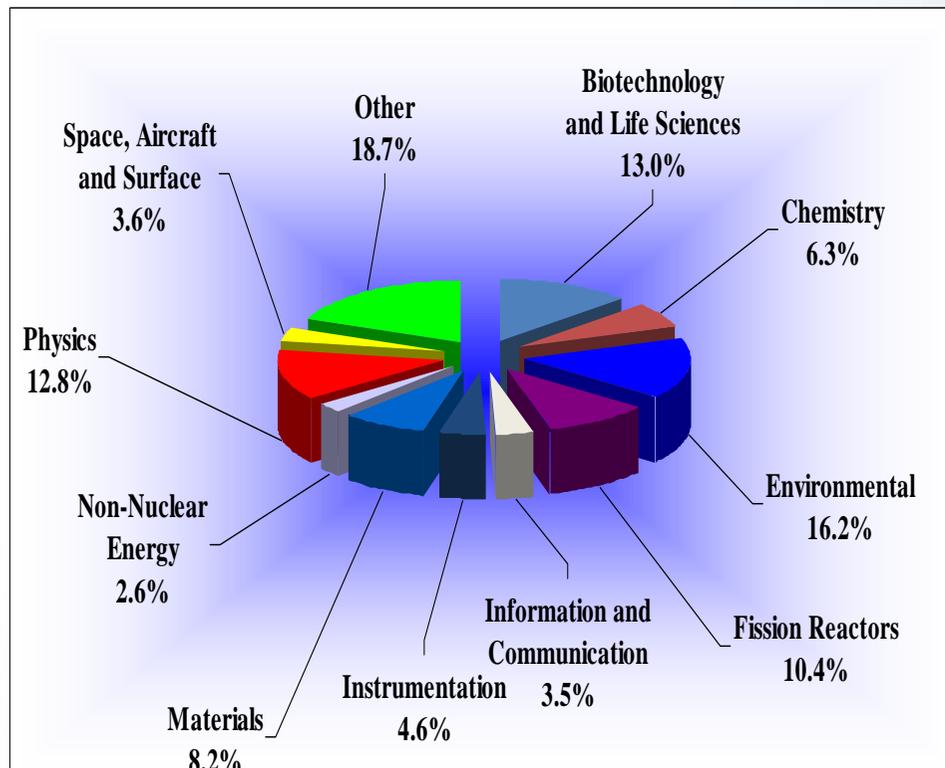
- Over 70 000 scientists/experts working with ISTC projects and benefiting from other ISTC programs
- 830 M\$ support
- Thousands of scientists benefiting from mobility program
- Hundreds of conferences, seminars, workshops and working meetings supported by ISTC



# ISTC Core Activity: R&D Projects

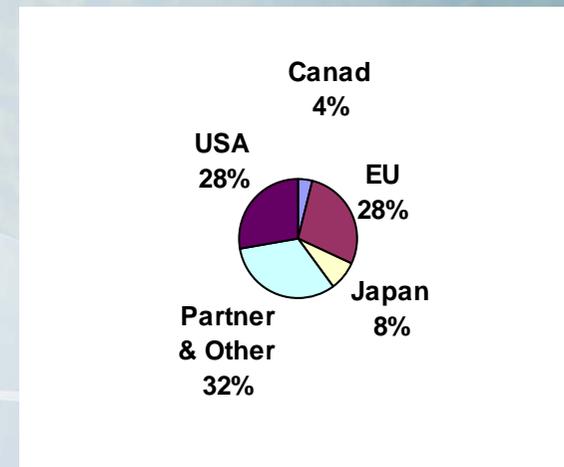


## Technological Areas of the Projects



**Total R&D funds 830 M\$**

## Funding Parties shares



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# ISTC : New Modes of Operation



## ➤ Programmatic Approach (PA)

- Identify areas of technical strength and scientific expertise of ISTC project participants
- Possible call for proposals
- Transform projects into “sustainable programs”, maximizing efficiency and relevance to international science and cutting-edge research
- Further focus on partner projects

## ➤ Targeted Initiatives (TI) – a package of ISTC instruments

- one of the instruments to implement PA in the R&D area, that provides to CIS scientists a format alternative to standard ISTC projects in their transition to sustainable mode of operation in the market environment
- ISTC Parties and Partners contribute voluntarily to the TI through funds allocation for R&D tasks presented by the Secretariat in a form of a Work Plan

Russian-French-German Laser Symposium 2009 17-22 May, Nizhny Novgorod, Russia

## ➤ International Science Laboratory program



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# Programmatic Area:



- Global Security;
- Sustainable Energy Technologies;
- Environmental Technologies;
- Biotechnology, Public Health and Agriculture;
- High Energy Physics (edge physics); and
- Nanotechnology

*Most of these areas are dependent on “large facilities”*



# Special tools of ISTC:

International Science Laboratory  
and Contact Expert Groups



# International Science Laboratory (ISL)

## Why and how to establish ISL



# What is an International Science Laboratory?



***This Program is for creation and operational support of International Science Laboratories recognizing the need for more **systematic and structured (programmatic)** approach to the goal of the long term sustainability of scientific teams and sustainable international partnership***



# ISL – Term of Reference



- Legal Status
- Framework:
  - Application for the ISL creation
  - **Trilateral agreement : 2 partner institutes and ISTC**
  - Principles of operations
  - Staffing
  - Relations with the hosting institution
- Financial Framework



# Try ISL if:



- You are committed to long term collaboration with your ISTC partner and have financial means
- There is a unique facility/infrastructure/equipment/experiment for the partners you want to exploit together
- You want to benefit from ISTC tools (and privileges), competence, infrastructure and significant risk and failure **reduction**



# ISTC - Contact Expert Groups



- Groups of international outstanding experts with similar scientific/technical interests. The participants represent Russia/CIS and international community.
- The purpose of such groups is to determine a common scientific strategy and roadmaps to achieve the strategical objectives
  - Incubation of new projects and programs
  - Determining international priorities and harmonisation of the program



# ISTC - Contact Expert Groups



- **Success stories in nuclear technology:**
  - CEG P&T – stimulating stormy development of transmutation research in Europe
  - CEG PLIM – Plant Life Management: coordination and exchange of results. Particularly important for VVER possessing European countries
  - CEG SAM – Severe Accident Management. Common experiments, projects, exchange of results. Coordination of the European and Russian programs
  - CEG Fusion – a coordination platform leading to projects related to JET, ITER and alternative fusion concepts



# Example of successful projects related to large facilities



# CERN - ISTC Projects

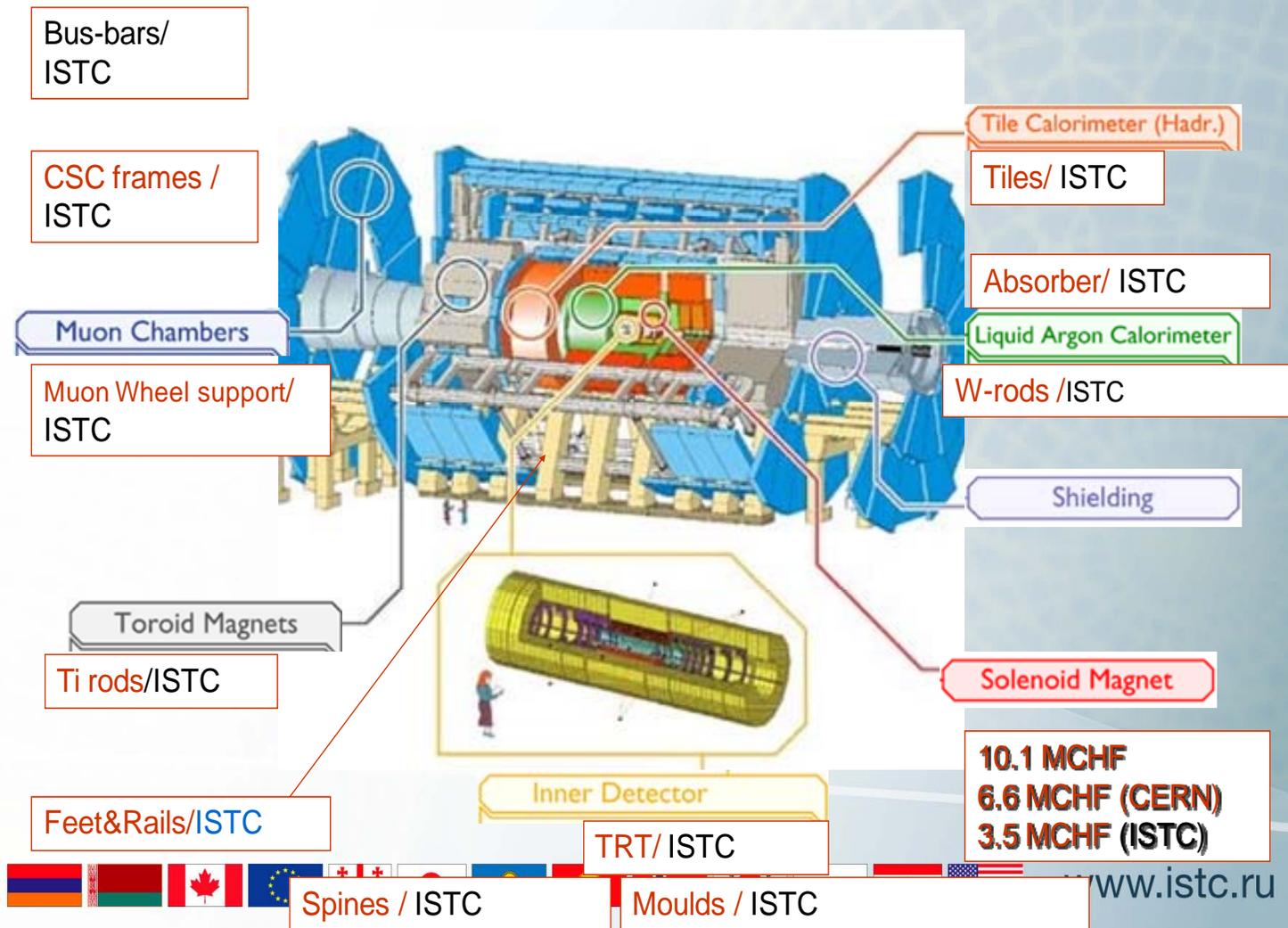


- From 1995: about 45 projects, some of them with multiple extensions, among them:
  - Regular projects
  - Regular projects with CERN co-funding
  - 7 Partner Projects
- The majority of the projects are very successfully completed;
  - 9 are continuing;
  - Total projects volume 31 M\$US
  - of which ISTC contributed 12 M\$US
  - and CERN 19 M\$US
- One particular ISTC project generated a 36M\$ commercial contract for single crystal delivery



# ISTC funded devices in key multibillion CERN detectors!

## Example of ATLAS



Doors/  
ISTC

Muon absorber  
design / ISTC

12.9 MCHF  
1.6 MCHF (CERN)  
11.3 MCHF (Rus)

Time  
Projection  
Chamber

Particle  
Identification  
Detector

High-Momentum  
Particle  
Identification  
Detector

М Н Т Ц

L3  
Magnet

Absorber

Dipole Magnet

Yoke  
magnet/  
ISTC

Mechanics/ISTC

Time-of-Flight  
system/ ISTC

Muon Chambers

Inner  
Tracking  
System

Photon  
Spectrometer

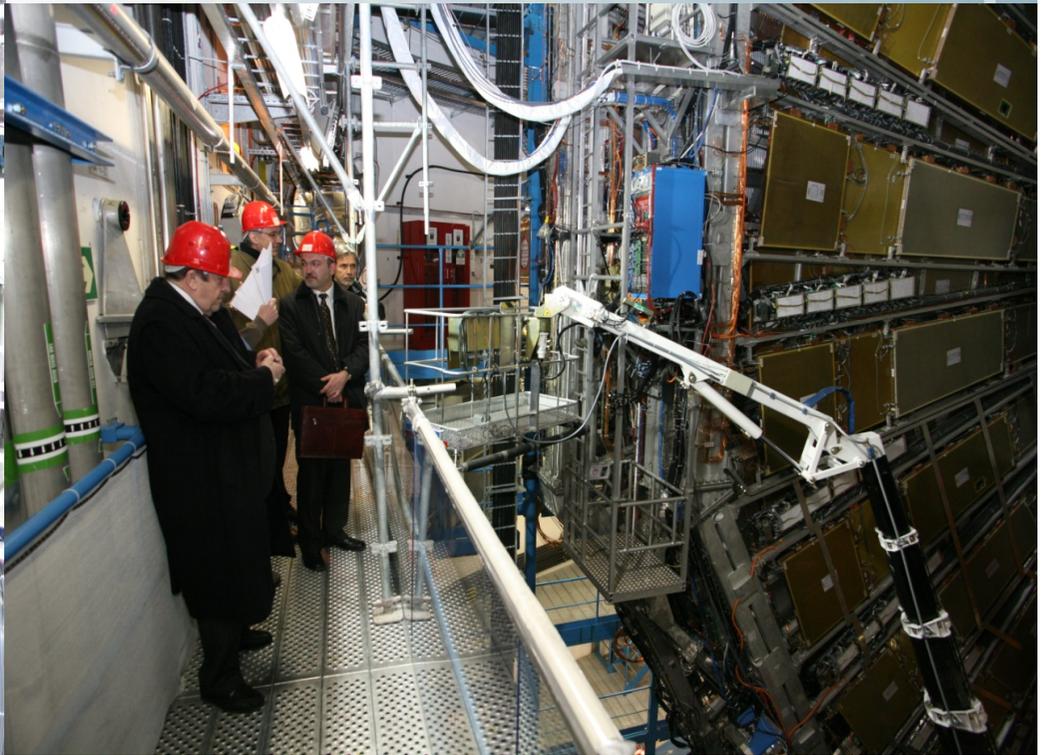
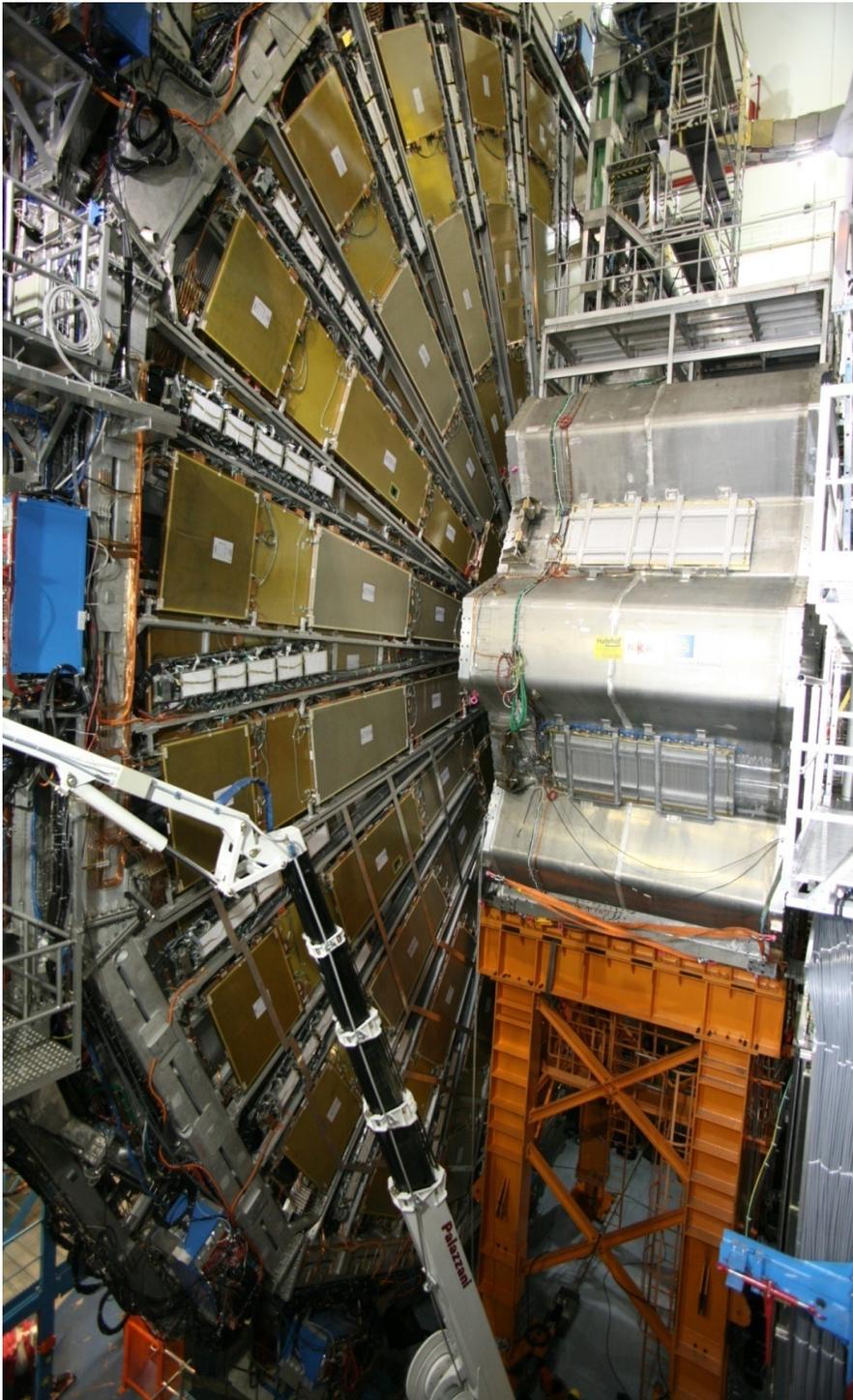
Carbon structure/  
ISTC

Crystals/ISTC

Alice

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**Exceptional examples:  
Bogoroditsk PbWO<sub>4</sub> Crystals for  
the CMS Ecal  
# 354 - # 354 B  
#1718**



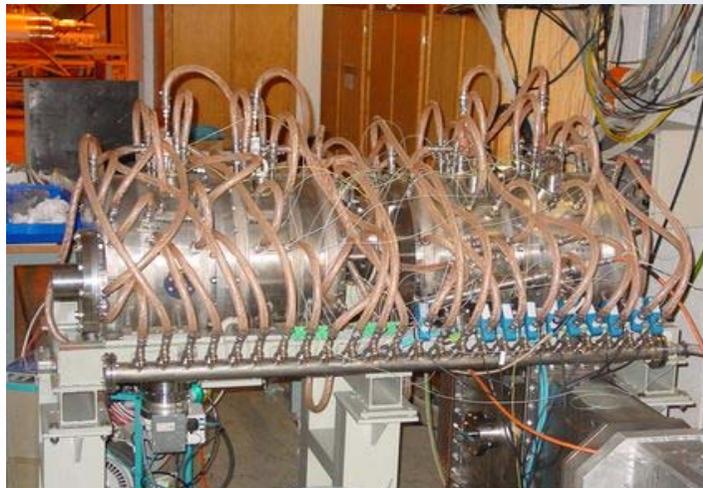
**80'000 crystals  
for CMS Electromagnetic  
Calorimeter**



# FUTURE: DEVELOPMENT AND CONSTRUCTION OF COMPONENTS FOR AN UPGRADE OF THE LARGE HADRON COLLIDER AT CERN



In order to achieve these critical upgrades, CERN collaborated closely with the Budker Institute of Nuclear Physics of the Siberian Branch of the Russian Academy of Sciences (Novosibirsk) and the Russian Federal Nuclear Center – Russian Scientific Research Institute of Technical Physics (Snezhinsk) under project # 2875 (funded by the EU and CERN)



The prototype at CERN high power RF test stand

One of the required upgrades was the CCDTL (Coupled Cavity Drift Tube Linac) structure, which is part of the proton injector complex at CERN. Starting from the experience of a preliminary CCDTL prototype manufactured at CERN, the project participants developed an improved CCDTL design based on production technologies available at the two cooperating institutes. The design takes into account all aspects of machine installation including assembly, integration into the overall structure of the LHC, support structures as well as transportation and alignment. A CCDTL prototype was built and delivered to CERN, where it was assembled by key project participants and tested at low and high RF (radio frequency) power, achieving all technical objectives required for operation with beam in an accelerator environment.



# FUTURE: DEVELOPMENT AND CONSTRUCTION OF COMPONENTS FOR AN UPGRADE OF THE LARGE HADRON COLLIDER AT CERN



The activities within project # 2875 evolved into 2 new complementary projects # 3888 (regular project funded by EU with a financial contribution from CERN) and # 3889 (partner project, fully funded by CERN). The aim of these projects is to develop, manufacture and investigate experimentally the Russian Federation cavities and entire CCDTL accelerating section in the energy range of 50-100 MeV for the new accelerator Linac4 (proton injection system). The developments that come from project #2875 will be widely utilized and further promoted within these new projects.

A SCL (Side Coupled Linac) structure for the Linac4 high energy end has also been studied. A representative technological model of the SCL cell was designed taking into account such critical aspects as thermal load and tuning.



CERN RF team welcoming the arrival of the CCDTL prototype

**Outcome:**  
Scientific components for the upgrade of the CERN facilities, necessary to make the Large Hadron Collider (LHC) experiment a success, were developed, produced and manufactured



CERN March 2008. Meeting of ISTC with CERN directors





B.I. Stepanov  
Institute of Physics  
NAS Belarus



International Science  
and Technology Center



Fraunhofer  
Institut  
Zerstörungsfreie  
Prüfverfahren



# Major Achievements of the **International Science Laboratory** for **Optical Diagnostics**



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Institut  
Zerstörungsfreie  
Prüfverfahren



## ISTC-ISL-LOD consists of two branches:

**the first branch** is a part  
of the **Fraunhofer Institute  
for Nondestructive Testing**  
(Saarbrücken and Dresden,  
Germany);



**the second branch**  
is established as  
the **laboratory for Fundamental  
and Applied Research**  
of the **B.I. Stepanov Institute of Physics  
of NAS of Belarus** (Minsk, Belarus).



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# ISL LOD's Profile: Development of Modern Advanced Optical Methods & Technologies for Industry and Medicine



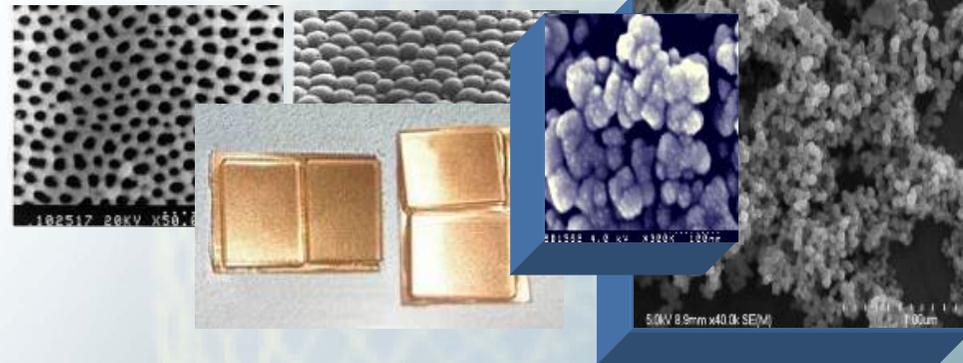
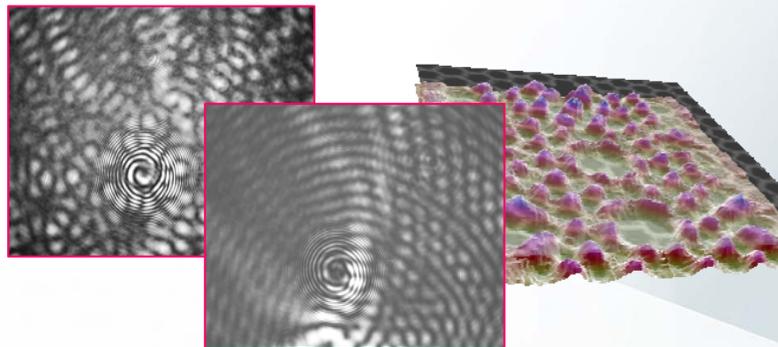
- In-situ metrology; controlling fab process flow; testing quality of products during their fabrication
- Bio-nano-technologies. Metrology and Sensors
- Life Science and Health
- Multi-sensor systems for monitoring of compound objects (planes, automobiles, energy setups and so on) in the process of their functioning



# Future ISL LOD's technology



Bionanosensors and testing methods for Lifescience based on nanodiamonds and porous Al<sub>2</sub>O<sub>3</sub> technology



Speckle and opto-acoustic methods for material characterization and remote-sensing in industry

Methods and tools for material characterization at nano-scale (based on confocal microscopy, space-resolved ellipsometry and scatterometry, and SNOM)





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Zerstörungsfreie  
Prüfverfahren



# Principal ISL's services:

- Development of customized optical solution for in-situ metrology and structural health monitoring
- Development of Bionanosensors and testing methods for lifescience
- Numerical modeling in optics, including concept design and analysis of optical systems, development of data processing algorithms, 3D-rigorous diffraction modeling, design of diffraction optical elements and photonic crystals, software development and measurement process automation
- Advanced optical measurements, using Laser confocal microscopy; Fluorescence Life-Time Imaging (FLIM); Scanning-near-field optical microscopy and other optical methods
- Training in optical metrology and laser systems



# Pre- and Conceptual phase of large facilities

An example of Subcritical Assembly in Dubna (SAD - project #2267) and stimulating nuclear waste transmutation research



# SAD – Russian Collaborators



- **JINR - leading organization, scientific supervisor;**
- **GSPI - the general designer;**
- **NIKIET – subcritical blanket and target designer;**
- **VNIINM - the developer of a fuel element;**
- **IA “Mayak” - manufacturer of the fuel;**

**Over 180 people worked on the project**

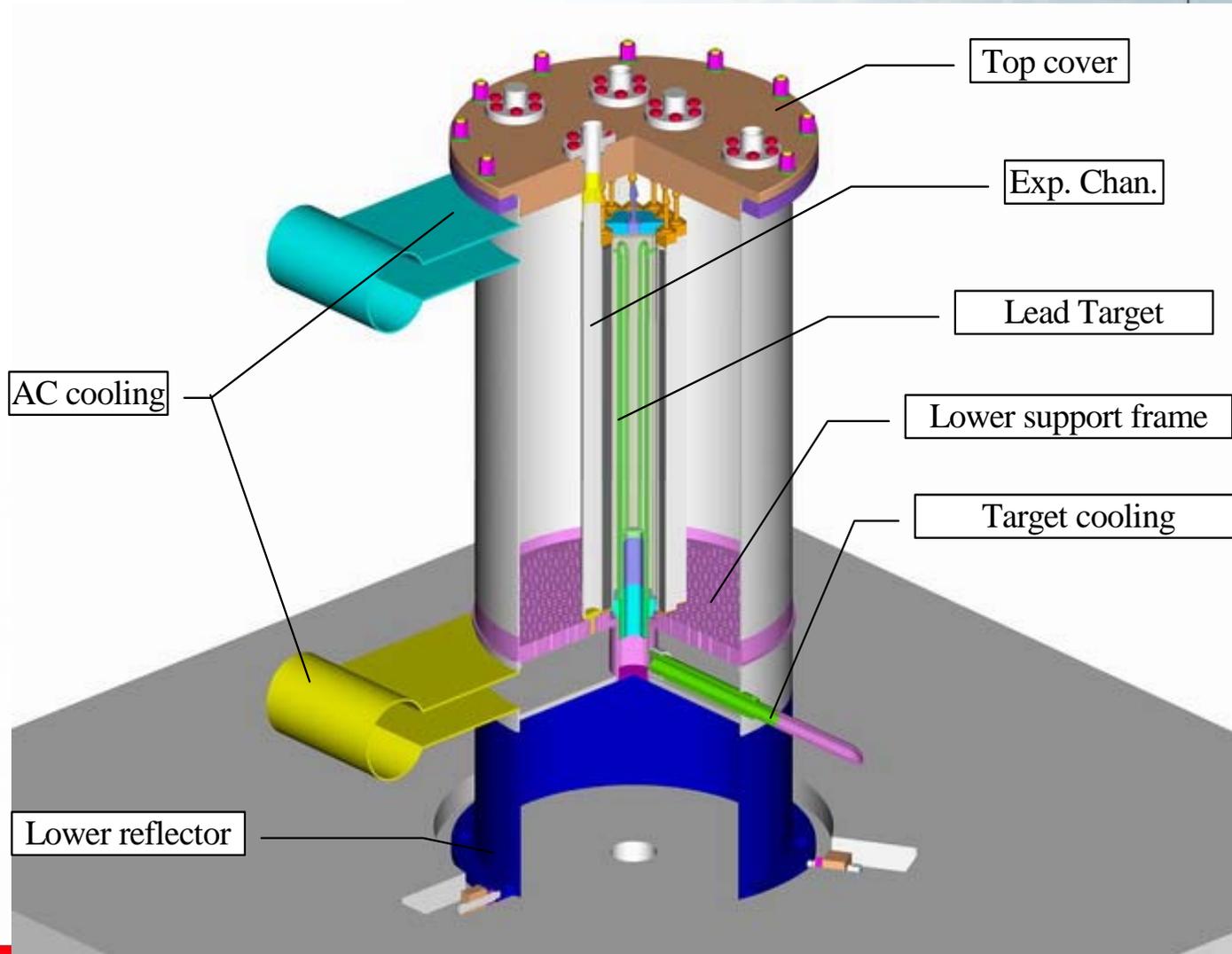
# SAD – European Collaborators



- EU-EUROTRANS Project
  - KTH, Sweden
  - FZK, Germany
  - CEA, France
  - CIEMAT, Spain
  - SCK-CEN, Belgium
    - ENEA, Italy
    - IPJ, Poland
    - Rez, Czech Rep.



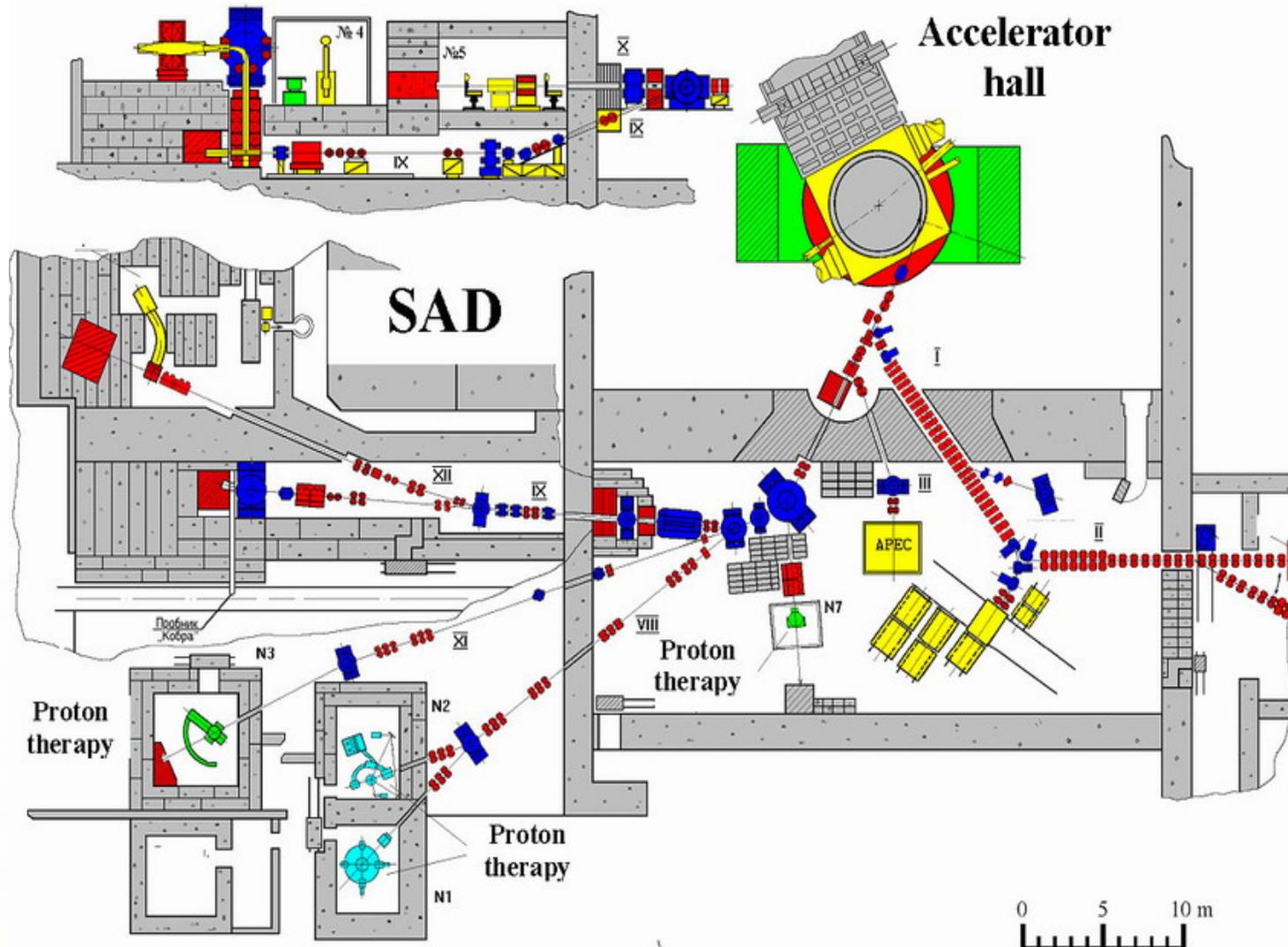
# What is SAD? Coceptual design of Transmutation System



# Basic infrastructure as thought

I S T C

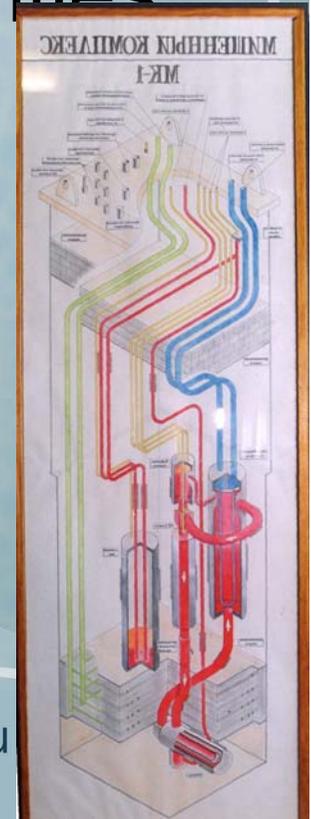
5 years



# Sustainability:



- Russian Federation considers now to concentrate transmutation research at Snezhinsk and to continue these activities
- Europe is proposing MYRRHA facility
- MEGA-PIE project at PSI
  - - a child of ISTC #559



# ISTC Targeted Initiatives

A good platform for start-up  
activities



# ISTC Facilitates Collaboration in Ultra-High Intensity Light Science and Technologies



- **At the end of 2006 the European Commission (EC) ranked and selected for support three large-scale European laser programs ELI, HiPER, and PETAL**
- **A high level and important contribution of Russian scientists in the domain of extreme light science and technologies is acknowledged by their results**
- **Ultra-High Intensity Light Science and Technologies is a very broad and promising area of research which encompasses all three abovementioned EU projects**



# ISTC Promotes Cooperation in this Domain through



## ➤ ISTC projects (regular and partner)

- ISTC has considered 14 projects in this domain for funding. 8 projects have been funded with the total amount of 2.3 M\$.
  - Project #3927 is a Partner Project (STFC-HiPER)

## ➤ ISTC workshops and seminars

- ISTC hosted an International Workshop “Russian ELI/HiPER/PETAL at ISTC” at its premises in Moscow November 24-25, 2008
- Franco-Russian ISTC Workshop on physics with PETAL and the diagnostic development, Bordeaux, 8-11 March 2009, in (jointly with ILP and RAS)
- Russian-Franco-German Laser Seminar-2009 in N. Novgorod, 17-22 May, 2009, supported by ISTC



# High Impact of the Workshops



- **The Moscow Workshop 2008 helped identify high-priority subjects and research groups interested in collaboration on all the three abovementioned EU projects**
- **The participants of the Bordeaux Workshop 2009 proposed ideas for future collaborative projects, implying further experiments, development of diagnostic and large optics equipment for the PETAL installation**
- **A MOA between the French Association on Lasers and Plasmas and the Federation of Research Lasers and Plasmas being one party, the RAS and the ISTC being the other parties thereto, was signed in Bordeaux, in March 2009**
- **After the Bordeaux Workshop on April 17, 2009 a Joint ILC MSU-LPI research laboratory “Relativistic Laser Plasma” was established**



# Targeted Initiative – unified platform seeking Public and/or Governmental Support



- The RFBR, RAS have announced inviting open tenders on interdisciplinary basic research (005 – Basic research in high field matter interaction)
- RF Ministry for Education and Science has announced inviting open tenders on Point 1.1 “Science Research, Involving Teams from Research and Educational Centres” of the Federal Targeted Program “Research, Science and Educational Staff of Innovation Russia” for 2009 – 2013
- ISTC – an option for co-funding with the European Framework Program

Russian-French-German Laser Symposium 2009 17-22 May, Nizhny Novgorod, Russia



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# CONCLUSIONS



- **ISTC offers a very convenient framework for initial steps in large research infrastructure initiatives. Can effectively support the initial steps.**
- **ISTC frame is a very efficient risk and hinder minimizer in cooperation with Russian Partners in S&T due to its legal status and well established mode of operation**
- **ISTC has established mechanisms for international cooperation dealing with "sensitive" research and technology. ISTC promotes and facilitates "responsible science approach" and responsible knowledge management**



# CONTACTS



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**Russian-French-German Laser Symposium 2009 17-22 May, Nizhny Novgorod, Russia**



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# THANK YOU FOR ATTENTION

Russian-French-German Laser Symposium 2009 17-22 May, Nizhny Novgorod, Russia

